Title: Calibration of Atmospherically Induced Delay Fluctuations

Authors: G.M. Resch, C.S. Jacobs, S.J. Keihm, G.E. Lanyi, C.J. Naudet, A.L. Riley, H.W. Rosenberger, A.B. Tanner

Address: Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA

We have completed a new generation of water vapor radiometers (i.e. the A-series WVR) in order to support radio science experiments with the Cassini spacecraft. These new instruements sense 3 frequencies in the vicinity of the 22.2 GHz emsission line of water vapor within a 1 degree beamwidth, co-point with the radio telescope down to 10 degree elevation, and features almost an order of magnitude improvement in temperature stability compared with earlier WVR designs. For many radio science experiments, the error budget is likely to be dominated by path delay fluctuations due to atmospheric water vapor along the line-of-sight to the spacecraft. In order to demonstrate the performance of these new WVR's we have attempted to calibrate the delay fluctuations as seen by a radio inteferometer operating over a 20 km baseline with a WVR near each antenna. The characteristics of these new WVR's will be described and performance will be presented indicating an accuracy of 200 - 500 micron in tracking path delay fluctuations over timescales of 10 sec to 30 minutes.